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# SCIENCE

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## ACADEMIC IDEALS.\*

THE beginning of an academic year calls up at once the lighter thoughts of pleasing associations and the graver thoughts of inspiring obligations. Here on the tableland of intellectual life youth and age meet to labor for a season in the fields of knowledge and discovery. The confident optimism of youth seeks to be chastened by the gentle admonition of experience. Youth imparts its buoyancy to age, age imparts its wisdom to youth, and both are kindled by the glow of elevating aspirations. It is a time, therefore, for a blending of our lighter and our graver reflections.

Being delegated for the moment to speak to and for this academic body, it has seemed that some considerations on academic ideals might serve to awaken thought and to arouse zeal appropriate to the occasion. In the abstract, however, this would appear to be a delicate and a difficult subject; delicate because of diversity of sentiment, and difficult because of diversity of judgment, amongst those best qualified to speak, as to what academic ideals are, or as to what they should be. Hence it may seem fitting at the outset to suggest application to the views here set forth of the Socratic caution that they can hardly be exactly as represented, if not the more sweeping caution of Marcus Aurelius—'Remember that all is opinion.' But the delicacy and the difficulty of the subject

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\* Address read on the occasion of the opening exercises of Columbia University, September 28, 1904.

are probably more apparent than real to us; for this is a university assembly, and it is one of the highest functions of a university to examine the various aspects of debatable questions without suppression of candor and without loss of humor.

The typical American university of our time is a complex organization which has grown up rapidly from the typical American college of a half century ago. It has its undergraduate, its professional and its post-graduate schools, as we see them in Columbia University to-day. It has a heterogeneous aggregate of students animated by a great variety of aims and purposes. Its curricula embrace courses of study and research quite unknown to the educated public of thirty or forty years ago; and its degrees recognize professions quite unheard of before the middle of the nineteenth century. Moreover, the modern American university has broken to a large extent with custom and tradition. It is an institution characterized by intellectual agitation, by adjustment and readjustment, by construction and reconstruction, the end of which is not yet in sight. This complex organization is the resultant of the more or less conflicting educational activities of our times. It is a resultant due in part to world-wide influences; it expresses a generalized academic ideal.

Whatever may be our inherited prejudices or our calmer judgments, the attainment of this ideal must be regarded as a remarkable achievement. Here, for example, in this institution, we find all kinds of subjects of study, from the most ancient to the most modern, from the most practical to the most theoretical, from the most empirical to the most scientific, from the most materialistic to the most spiritualistic, all on a plane of intellectual equality and all equally available to those fitted to pursue them. Little surprise is manifested at the close juxtaposition of a professor of

metallurgy and a professor of metaphysics, and it has actually been demonstrated that professors of poetry and professors of physics can dwell in peaceful activity under the same roof. Here too the ten or a dozen faculties and the various student bodies mingle and intermingle in a spirit of cooperation and mutual regard almost unknown outside, and hitherto little known within, the academic world.

The mere atmosphere, then, of a modern university must energize and elevate all those who come within its influence. But the domain of this atmosphere is not bounded by academic walls. It is not a limited medium within, but is actually a part of, the unlimited medium of the intellectual world; for the modern university has broken also with custom and tradition in allying itself closely with the external world of thought. Through interaction of the intramural and the extramural spheres of thought the instructor and the student are kept face to face with the vantage ground of contemporary life, whence they may look forward as well as backward.

The modern university is an institution of learning in the full sense of the word; an institution wherein instructors teach students, and wherein, reciprocally, to a very important degree, students teach instructors; for that instructor is fossilized who does not learn more per year from his students, if they are worthy of the name, than they learn from him. Together they work diligently not only to become acquainted with the known, but still more diligently to penetrate the secrets of the unknown. Among them there is a sentiment that condemns alike the instructor who would impart knowledge by the method of the rotary calabash, and the student who, with saturnine stolidity, would absorb only the information poured into his ears. Dwelling thus at a university, not apart from, but actually in, the world of

contemporary thought, students may best fit themselves for the world of contemporary life; and while they may justly esteem it a great privilege to graduate from an historic college, or from a professional school of international reputation, they should esteem it a far higher privilege to graduate from a great university.

It should be observed also that the resultant ideal which has been attained in our best universities is not fixed but progressive, not inflexible but subject to improvement. It is a development whose sources are seen in the earliest civilizations, whose growth was dimly perceived during the middle ages, and whose conscious appreciation is a realization of the century just past. The method which characterizes this development is the method of science. It dates essentially from the epoch of Galileo and Huygens. It rose to a maximum of brilliancy in its interpretation of material phenomena during the epoch of Newton and Leibnitz, and during the epoch of Laplace and Lavoisier; and it has recently illuminated a new domain through the labors of Darwin and Spencer. Galileo, Newton and Laplace gave us a system of the inorganic world; Darwin and Spencer have given us a system which includes the organic world as well.

The method of science has permeated all regions of thought and animated all of the commercial, industrial, political, social and religious activities of men. Whether we welcome it, deplore it, or indifferently acquiesce in it, the fact seems undeniable that the method of science and the doctrine of evolution are the most effective sources of the intellectual enterprise of our day. Through anthropology this method and this doctrine have given a transcendent interest to the study of man; for they show that man may not only investigate the rest of the universe, but that he may, by the same means, investigate himself. Consciously or

unconsciously, the terminology, the figures of speech and the modes of thought of science are being applied to all subjects and objects of human concern. They have penetrated the depths and the darkness even of the polite literature of our times.

But while the ideal thus outlined appears to be the effective, or working, ideal at which we have arrived, it goes without saying that it is not the only ideal entertained by those whose opinions on academic questions are worthy of regard. On the contrary, many eminent minds deplore present tendencies and write and speak regretfully of the vanishing ideals of the past. Grave publicists, accomplished men of letters and subtle philosophers see little but danger in the educational readjustments of recent times. They deplore especially the decline in popularity of those ancient studies long called the humanities and the contemporary rise and increasing recognition of the newer studies. Culture, they seem to claim, comes inevitably through the pursuit of the former, never through pursuit of the latter. They go so far in some cases as to decide at what point the study of a subject ceases to be liberal and begins to be illiberal, or professional. Give a student by the ancient formula, their facile editors say, that modicum of learning which would otherwise be dangerous, stamp him with the degree of A.B., and he becomes an aristocrat. They take a gloomy view of the restless present and they are little hopeful of the future; for they hint darkly of 'the bankruptcy of science' and of disasters impending if we do not return to ancient ideals.

Argument concerning these matters is fruitless. Logic avails as little in an educational campaign as political economy avails in a presidential campaign. Appeal must be had to our sense of humor and to the arbitrament of time. It may be observed, however, that these apostles of

doubt and prophets of evil are slowly disappearing. They are more numerous outside than inside academic walls, they are less strenuous in large than in small colleges, and they are no longer dominant in the best universities. From a philosophic point of view they illustrate the action of a most interesting and usually beneficial sociological principle. When consciously applied this principle may be called the law of rational conservatism. When unconsciously applied it may be called, in analogy with a great physical principle, the law of conservation of ignorance. It is so much more important for society to protect itself against the follies of the unwise than it is to profit by the improvements of the wise, that progress comes, generally, only painfully slowly. May we not entertain the hypothesis that the contemporary opponents of educational reforms have been animated towards them rather unconsciously than consciously? Having drunk deeply at certain fountains of learning, they appear to be sure that there are no others. They seem to have been, and to be, always receding. For more than a thousand years, in fact, the gaze of most scholars has been fixed so steadfastly on the glories of the past that it has been possible to advance only by marching backwards.

Through the unconscious action of the law of the conservation of ignorance we are always in danger of disproportionate estimates of educational values and of erroneous judgments in the larger affairs of life. We involuntarily revert to precedent, commending what is old, condemning what is new. Thus, to give a concrete illustration, fear and panic would be visible in our faces if we did not understand the mythical significance of the names Phobos and Deimos lately applied to the moons of the planet Mars; but very few of us would betray the slightest mental disquietude at our

profound lack of knowledge of the properties of the atmosphere which is the medium of communication between you and me in this room. Thus, also, in spite of the obvious aphorism that all men are human, they have been divided into humanists and non-humanists, Matthew Arnold, for example, being one of the former, and the founder of our John Tyndall Fellowship being one of the latter. And stranger still, one might infer from the slowness of legal and constitutional reforms, and from many current arguments opposed thereto, that laws and constitutions are not made by men for men, but that, in some mysterious way, men are merely experimental material for the training of crafty lawyers and sagacious politicians.

But we have broken irrevocably with the past; not in the sense of disregarding the rich heritage of experience from our distinguished predecessors, but in the sense that their customs and traditions no longer dominate us. We have corrected their observations for geocentric parallax; and we must now correct their observations for anthropocentric parallax, just as our successors, if they prove progressive, will surely correct our blunders and avoid our errors. The need of corrections for anthropocentric parallax in educational affairs is now widely recognized. It leads to the investigations of Mosely Commissions, to the conferences of the Association of American Universities, and to the broader conferences of world's fair congresses. It is the chief source of the educational activities of our day. In these activities are to be seen the most hopeful signs of the times; for while agitation does not necessarily mean progress, serene contentment is pretty certain to mean stagnation, if not regress.

And the readjustment now going on in the academic world must continue. It is a part, simply, of the readjustment going on

in the intellectual world at large. We are, so to speak, in a state of unstable equilibrium, wherein mental repose can be purchased only at the price of mental somnolence. Great as have been the enlargement and the appreciation of educational and professional opportunities during the past three or four decades, we may confidently anticipate still wider enlargement and appreciation in the future. New divisions of knowledge may be expected to arise, and old divisions may be expected to undergo marked expansion, redistribution or emendation. The so-called humanities, especially, must be broadened, purified and elevated if possible to the intellectual level of the more highly developed sciences. It is clear, indeed, that in any revision of the humanities some matters may be redistributed, if not discarded, with advantage. The reckless amours and the clandestine peccadilloes of ancient and modern royalty, for example, should be transferred from the historian and the novelist to the anthropologist, the alienist and the pathologist. Such humanities, and many others of like kind, can hardly stand in comparison with the constancy of the stars and the beauties of harmonic analysis.

All these matters of controversy, however, belong rather to the lower than to the higher life of a university. How a student acquires elementary training is an academic question in the narrower sense of the word. The world cares little for educational ways and means unless they can commend themselves by results. Attainments must be tested by achievements and proficiency must be proved by progress. To rise to this standard of excellence is the ideal of the higher life of a university. It is only by the pursuit of, and in the realization of, this ideal, that instructors and students may keep pace with and contribute adequately to the advancement of modern knowledge. Those who would separate

theory from practice, those who would draw lines of invidious distinction between pure and applied science, along with those who would mistake a part of archeology for the whole of education, are all alike inimical to the trend of current progress.

It is the highest function of a university to cherish this ideal and to promote especially the arduous labors essential to fruitful original research. Those who can add somewhat to the sum and substance of permanent knowledge by the establishment of a physical, a social, an esthetic or an ethical principle, are the greatest benefactors of our race. Of the many who feel drawn to this high calling, however, few are destined for fame. Only those who prefer the turmoil of conflicting thoughts to the tranquility of inherited opinions, who can bear alike the remorseless discipline of repeated failure and the prosperity of partial success, may hope to attain renown. But, as those serve also who stand resolutely and toil patiently at their allotted tasks, so is there room in the grand aggregate of human achievement for the humblest as well as for the noblest of investigators.

The ideals, then, of a modern university, like the ideals of the intellectual world at large, contemplate achievement and progress in all grades of work from the lowest to the highest. They demand endless patience and unflagging industry from all who seek to rise above the dead level of mediocrity. The opportunities now afforded for the pursuit of, for the acquirement of, and for the advancement of, learning are greater than ever before. We are the heirs of the ages. But along with an increasing heritage there come increasing duties and increasing responsibilities. It rests with us to show that we are worthy of this heritage and able to meet these duties and responsibilities. This is the line of endeavor we resume to-day, and the spirit

of the hour bids us look forward with cheerful optimism.

R. S. WOODWARD.

*THE AMERICAN ASSOCIATION FOR THE  
ADVANCEMENT OF SCIENCE.*

*THE PRESENT STATE OF GEODESY.\**

THE problems of geodesy, like those of most sciences, enter upon new phases with the accumulation of facts bearing upon them. The problem of determining the amount of the earth's compression was added to that of determining the size of the supposed sphere as soon as Newton had demonstrated its oblateness. The controversy to which Newton's theory gave rise was settled by the famous geodetic operations of the eighteenth century which furnished the cardinal facts in regard to the earth's figure and size.

What may be regarded as the slow progress of a more precise knowledge of the earth's dimensions since that time must be attributed to the difficulties inherent in the problem.

In the first place the dimensional measurements must necessarily be confined to the continental areas which occupy but three elevenths of the earth's surface. The configuration and relationship of these areas make it impossible to girdle any section of the earth by direct measurement.

Secondly, the admeasurement of these areas is far beyond the reach of individual enterprise and can only take place when the practical needs of governments suggest the utility of great mensurational surveys which at the same time and without great additional expense will furnish the data required for a more perfect knowledge of the spheroid. In making this statement it is not forgotten that individuals and governments did undertake in all ages

measurements for the purely scientific purpose of determining the size of the earth, for the desire for knowledge on this subject may be reckoned coeval with intellectual development of man.

Happily it may be said also that by their collective action the governments of the world have shown in recent times that it is considered a governmental function to support and promote researches in this branch of science. I allude, of course, to the existence of the International Geodetic Association. It will not be out of place to say in this connection that the association exists by virtue of a formal convention between the participating governments, which are, at the present time, the United States, Japan and Mexico and all the European nations save Portugal, Roumania and the group south of the Danube. No account of geodesy would be complete that failed to consider the aims and labors of this association. Its history is part of the history of geodesy since 1861. At that time it began its career as the *Mittel Europäische Gradmesung*. In a few years it expanded into an European association and in 1886 it became international.

It is not generally known that it was this association which instigated the French government to invite the world to establish an international bureau of weights and measures at Paris. Without detracting in any way from the labors of Bessel, Clarke and others in intercomparing geodetic standards, the successful labors of the bureau which in consequence was established in Paris removed at least some of the difficulties that were encountered by the investigators in this branch of science, and by those engaged in the practical work of the measurement of the earth.

The history of geodesy is full of instances of confusion and wasted energy due to the lack of a common standard, and the results of many arc measures which would

\* Address of the vice-president and chairman of Section A—Mathematics and Astronomy, American Association, Philadelphia, December, 1904.